Cell Membranes

1. The purpose of this lab is to give students a chance to practice the concepts of osmosis and diffusion as well as to learn how to identify permeable and selectively permeable cell membranes. In order to accomplish these goals, students will be viewing a selectively permeable cell (yeast) and a permeable cell (dead yeast).
2. The concepts covered in this activity are cell membranes, permeability, osmosis and diffusion. In connection with these topics, we also discuss the role of concentrations in the before-mentioned topics. By the end of this activity, students should be able to discuss the differences between osmosis and diffusion, discuss the effects of concentration on osmosis and diffusion and identify characteristics of semi-permeable and permeable membranes. The Illinois learning standard that corresponds with this lesson is 12A. I. 2: Apply scientific inquiries or technological designs to analyze the cellular organelles and functions, using different microscopic techniques, explaining functional processes chemically and structurally (e.g., osmotic, active and facilitated transport, enzyme action and protein/lipid/carbohydrate metabolism).
3. Students should be split up into pairs for this laboratory activity. Each pair of students should have at their table two pairs of goggles, two 400 ml beakers, two packets of yeast, a light microscope, two glass slides and cover slips and one bottle of methylene blue stain. There should also be enough hot plates for all of the students to heat their yeast for ten minutes. The students will be doing much of the preparation within the lab so it is only necessary to have all of the materials available and ready while not necessarily prepared yet.
4. This lab should take at least 40 minutes and no more than 50 depending on how much discussion is included in the beginning of the lab.
5. This lab does require the use of glassware and a heating element so it is necessary to have protective eyewear on at all times during the lab. It is also advisable to have students wash their hands since they will be working with bacteria although the yeast is not hazardous.
6. The purpose of showing the video on the red blood cell is to introduce the concept of osmosis and to show that the concentration gradient will dictate the movement of the solution into and out of the cell. It is important to highlight the question at the end of the packet that asks about the difference between the red blood cells and the yeast cells to explain why the yeast cells did not take in the methylene blue stain at first. The yeast should not take up the methylene blue before heating because its cell membrane is selectively permeable but the heat should break down the cell membrane enough to allow the stain into the cell.
7. The methylene blue stain can also be replaced with and iodine solution if methylene blue stain is not available. Also, the yeast can be pre-heated if time is in short supply for this activity.
8. Students should be split up into pairs for this laboratory activity. Each pair of students should have at their table two pairs of goggles, two 400 ml beakers, two packets of yeast, a light microscope, two glass slides and cover slips and one bottle of methylene blue stain. There should also be enough hot plates for all of the students to heat their yeast for ten minutes. The methylene blue may need to be refilled but students should only need one drop per slide. The slides will need to be cleaned or replaced in between labs. The yeast may be poured down the drain at the end of the lab and the light microscopes should be properly put away.